DOCUMENT RESUME

ED 128 294 SP 010 366

AUTHOR Howard, Mary Kay; Franks, Betty Barclay
TITLE The Biological Revolution: Examining Values Through the Futures Perspective.
INSTITUTION National Education Association, Washington, D.C.
PUB DATE 76
NOTE 33p.
AVAILABLE FROM National Education Association, 1201 Sixteenth St., N.W., Washington, D.C. 20036 (Stock No. 0709-3-00, No price quoted)

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS Artificial Intelligence; *Biological Sciences; Bionics; *Class Activities; Decision Making; *Futures (of Society); *Human Engineering; *Interdisciplinary Approach; Technological Advancement; *Values

ABSTRACT

The most value laden of futures issues are raised by contemporary biological research. Current biological research has reached the point where we must now ask such questions as: What should be the nature of the human in the future? Who should make these decisions? How should humans interact with the universe? The problems and possibilities of the biological revolution cannot be compartmentalized because they affect all areas of life. Teachers from social studies, biology, health, and humanities have found that these issues cannot be examined through the narrow perspective of only one discipline. Examining the biological revolution through the futures perspective enables students to take a multidisciplinary approach to tomorrow's critical issues today. This report describes a series of values questions which, combined with media, materials, and activities, can be used to form a unit to help students examine the biological revolution through the futures perspective. This unit can be added to existing courses, or portions of it can be inserted wherever teachers think it would be appropriate to involve students in values clarification activities. Because the approach is multidisciplinary, materials are included that can be used in biology, psychology, government, science fiction, humanities, and futures classes. (Author/MM)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED128294

The Biological Revolution

Examining Values Through the Futures Perspective

by Mary Kay Howard
Betty Barclay Franks

PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL BY MICROFICHE ONLY HAS BEEN GRANTED BY
NEA
TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER."

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

SP 010 366

A National Education Association Publication

The Biological Revolution

Examining Values Through the Futures Perspective

by Mary Kay Howard
Betty Barclay Franks

nea
National Education Association
Washington, D.C.

Copyright © 1976

National Education Association of the United States

Stock No. 0709-3-00

Acknowledgments

NEA gratefully acknowledges the permissions given to use the following:

Looking Forward: A Mini-Course in Future Studies by Mary Kay Howard and Betty Barclay Franks. Copyright © 1975 by McGraw-Hill Book Company, Inc. Excerpted with permission.

Come Let Us Play God by Leroy Augenstein. Copyright © 1969 by Harper & Row, Publishers. Excerpted with permission.

The Biological Time Bomb by Gordon Rattray Taylor. Copyright © 1969 by The New American Library, Inc. Excerpted with permission.

"Four Quartets" by T. S. Eliot. From *The Complete Poems and Plays by T. S. Eliot*. Copyright © 1950 by Harcourt Brace Jovanovich, Inc. Excerpted with permission.

Library of Congress Cataloging in Publication Data

Howard, Mary Kay.
The biological revolution.

Bibliography: p.
1. Bioethics—Study and teaching. 2. Biology—Social aspects—Study and teaching. I. Franks, Betty Barclay, joint author. II. Title.
QH332.H68 174'.2 76-27762
ISBN 0-8106-0709-3

CONTENTS

Introduction. 5

The Human as Biological Laboratory: The Immediate Concern 7

The Decision Makers: Who Should They Be? 17

The Universe as a Biological Laboratory: The Ultimate Question. 24

Footnotes. 28

Bibliography. 29

INTRODUCTION

The most value laden of all futures issues are those raised by contemporary biological research. The changes occurring in this area are so rapid and potentially explosive that Gordon Rattray Taylor has warned that we are sitting on a "biological time bomb." The only way we can defuse this bomb is to clarify our values and to take action now before it is too late.

Current biological research has reached the point where we must now confront such questions as: What should be the nature of the human in the future? Who should make these decisions? How should humans interact with the universe? The problems/possibilities of the biological revolution cannot be compartmentalized because they affect all areas of life. Teachers from social studies, biology, health, and humanities have found that these issues cannot be examined through the narrow perspective of only one discipline. However, examining the biological revolution through the futures perspective enables students to take a multidisciplinary approach to tomorrow's critical issues today.

Teachers can be aided in their work by the fact that theologians, doctors, humanists, government officials, and researchers are currently debating these questions. As a result, the new field of bioethics has emerged. The American Association for the Advancement of Science established a committee which has already issued a report dealing with scientific freedom and responsibility. The American Academy of the Arts and Sciences and the Institute on Religion in an Age of Science have devoted entire issues of their scholarly journals to values and the biological revolution. Those who attended recent meetings of the National Council for the Social Studies found that they were discussing biological issues, while teachers who attended the annual meeting of the National Science Teachers Association increasingly turned their attention to social issues. Because of interest in these areas, teachers, administrators, and researchers have created the American Educational Research Association: Special Interest Group for Research on Teaching of Science-Related Social Issues.

This report will describe a series of values questions which, combined with media, materials, and activities, can be used to form a unit to help students examine the biological revolution through the futures perspective. This unit can be added to existing courses or portions of it can be inserted wherever teachers think it would be appropriate to involve students in values clarification activities. Because our approach is multidisciplinary, we have included materials that can be used in biology, psychology, government, science fiction, humanities, and future classes.

THE HUMAN AS BIOLOGICAL LABORATORY: THE IMMEDIATE CONCERN

Before involving students in values clarification, it is important to establish a positive atmosphere in the classroom. Students will not feel free to share their opinions unless an environment of trust has been established. For this reason, the first activity is designed to encourage students to learn to work together and to begin communicating with one another in a positive way.

YOUR BODY—Today's Model

Before exploring the unknown, students should become familiar with the potential of the human body. The Blindfold Activity which follows helps students become aware of their own potential by depriving them of one of their senses:

> This activity dramatizes the way in which we use all our senses. Ask for volunteers for this experiment, and divide the class in such a way that each volunteer is the nucleus of a group. Those members of the class who did not volunteer can be the helpers in this activity. Two or three helpers are needed for each group.
>
> To prepare for this activity, you will need a sheet of colored construction paper for each volunteer. Before class, cut each sheet of paper into irregular shapes. Some of the sheets should be cut into as many as sixteen pieces, while other sheets of paper will be cut into fewer pieces. All the pieces from a single sheet of paper should be placed into an envelope. In addition, you will need scarves to blindfold the volunteers and a prize for the winning team.
>
> Let each team work in a different part of the classroom. If possible, give the envelopes with the most numerous pieces to those students who normally succeed in school. Do not tell the volunteers anything about what they will be doing other than they will be putting a puzzle together with the help of others.
>
> Blindfold the volunteers. Their task is to put the construction paper back together by matching up the pieces, just the way one would put together a jigsaw puzzle. However, only the blindfolded person may handle the pieces of paper. The other members of the team may only give verbal instructions; they may not

touch the pieces of paper of the blindfolded person. Tell the students that the winning team will receive a prize. It is important that all persons feel the pressure of competition with other groups. As you walk around the room listening to comments, you can keep the pressure on by informing the groups of the progress of their competitors. In some classes, this activity may take the entire period because the students will want to continue the project to completion, even though another team has already finished.

Ask the blindfolded persons how it felt to be without one of their senses. Ask the students which senses they used to solve the puzzle. Did they feel as if their helpers were talking down to them? Did the helpers try to encourage them or did they add to the frustration? Did the helpers talk among themselves, ignoring the blindfolded person? Did the blindfolded persons feel the presence of others? How were they affected by the pressure of competition?

Now ask the helpers if they ever pointed to any of the pieces of paper, even though the blindfolded person could not see what they were talking about. Also ask them if they gave instructions such as "See that piece," and "Move it over there." How did the helpers feel about what happened?

To conclude, ask the students what this activity has to do with the future studies. Some points they might mention are (1) communicating effectively, (2) viewing the world from the perspective of someone else when making plans for the future, and (3) becoming more aware of their own senses. Did the students realize that this exercise was demonstrating the miracle of the mind? In what ways did they use their brains in this activity? In what ways might they use their minds and bodies more effectively?[1]

To help students further appreciate the untapped potential of their own bodies, show the National Geographic film series on the human body and have them read the science fiction novel *Fantastic Voyage: An Amazing Journey through the Human Blood Stream* by Isaac Asimov (Boston: Houghton Mifflin Co., 1966). For a better understanding of the potential of the human body and mind working together, teachers can read *The Ultimate Athlete* by George Leonard (New York: The Viking Press, 1975).

Through the film, the activity, and the science fiction literature students learn to look at the human body from different perspectives. Trying on new perspectives is a very important concept in futures thinking. To understand a changing world, futurists maintain that we will have to look at new situations in new ways—to make the familiar strange and the strange familiar. Throughout

this unit, students will be encouraged to become more aware of unfamiliar values and to look at their own familiar ones in new ways, as a means of helping them to understand more thoroughly their own values.

YOUR BODY–Spare Parts Available

Once a positive atmosphere has been established and the students are more familiar with their own potential, they should consider the question: How far do we want to go in altering the body for the future? We now have the potential for changing the human body in a variety of ways and the residents of the 21st century should begin thinking now about the type of humans we want for the future. Throughout, we will be encouraging students to ask the question: "Should we?" instead of "Can we?" when considering the bio-technological revolution.

The activity in this section forces students to think about the parts that they would be willing to accept. The following continuum further involves students in values clarification:

Place the letters representing the following items on the continuum below, with 0 being the item you would be least likely to want as a body part and 10 being the item you would be most likely to want as a body part.

least likely to want — 1 2 3 4 5 6 7 8 9 10 — most likely to want

a. A jaw bone that is made of experimental synthetic materials
b. A tube of Dacron to replace diseased blood vessels
c. A ball in a cage which will serve as an artificial heart valve
d. An artificial kidney
e. A kidney dialysis machine

Next add to the continuum the letters of the following items which would require human donors.

f. Blood transfusion
g. A cornea transplant
h. A kidney transplant
i. A skin graft
j. A heart transplant
k. A brain transplant

Now circle the letters of the items which would be acceptable to you if the donor were an animal, such as a cow.

If you would be willing to donate organs from your body while you are still alive, list the body parts you would donate.

a. b.

c. d.

Would you be more likely to donate such an organ to a relative, friend, unknown person, or any of the three? Circle your answer.

* * *

List the organs you might be willing to donate to an organ bank after your death.

a. b.

c. d.

In the space below, write your reasons for deciding to donate or not to donate some of your body organs.[2]

Once students have completed their own survey form, they may want to share their opinions with each other. Students should never be forced to reveal their responses. Using this survey will stimulate a lively discussion of how we are currently remaking the human body and the degree to which we should continue this process in the future.

Frequently students refuse to believe that many of these alternatives are present realities. To dramatize this point, show the McGraw-Hill film *Man-Made Man.* Not only do the students see the body parts mentioned in letters "a" through "e" on the continuum, but they become involved with the dilemma of Evelyn Mokri who must decide whether or not to donate one of her kidneys to her brother.

To help students understand the concept of the rapidly accelerating rate of change and its impact on the biological sciences, teachers may want to use the charts contained in *The Future of the Future* by John McHale (New York: Ballantine Books, 1971). For example, the chart on page 188 shows the rapid development of antibiotics and illustrates the relationship between major medical advances and life expectancy. Teachers should then involve their students in a discussion of how the rapidly accelerating rate of change has already affected, is currently affecting, and will continue to affect our values in the future.

YOUR BODY–Tomorrow's Design

To further explore the issue of redesigning the human body, ask the students (either individually or in groups) to design an improved body for the future. As an alternative, they can create a body to perform a particular task or to live in a specific future environment. Teachers should listen for the comments of individuals who do not want to participate in this exercise. These students should prepare a presentation on why redesigning human bodies is not a wise alternative in planning for the future. Students should then compare their projects.

The values question will inevitably arise: should we be redesigning humans for the future? At this point, show *Redesigning Man: Science and Human Values* (Harper and Row Publishers, Inc.). This filmstrip series was created by Marion and Michael McDanield as a way of involving people in many of the values questions posed by the biological revolution. This series begins by taking the viewers on a tour of a factory from *Brave New World.* Students see how people have been designed to perform specific tasks. They are suddenly brought back to the present and find that similar issues are with us today. The filmstrip is a good introduction to *Brave New World* by Aldous Huxley (New York: Bantam Books, Inc., 1962).

For students with low reading ability, teachers can recommend several of the readings dealing with themes from the biological revolution in *The Future: Can We Shape It?* edited by William Goodykoontz (New York, New York: Scholastic Magazines, Inc., 1973.)

An excellent resource for teachers is *Pre-Meditated Man: Bioethics and the Control of Future Human Life* by Richard M. Restak (New York: The Viking Press, 1975). While it contains valuable scientific information, it is written in a popular style and can be useful as a way of interesting students in the new area of bioethics.

To learn how futurists use the concept of creativity and imagination, teachers should read "What Futurists Can Learn from Creative Problem Solvers," the chapter by Jay Mendell and Michael McDanield in *The Next 25 Years: Crisis and Opportunity* edited by Andrew A. Spekke (Washington, D.C.: The World Future Society, 1975). Students will find that throughout this unit, they will have to think creatively and imaginatively about the biological revolution in order to find solutions in keeping with their values systems.

GRAY: The Matter that Matters Most

Futurists and researchers also face significant values questions when dealing with the human mind, an area about which we currently know very little. Exploring this area presents tremendous problems and possibilities. This section asks the question: What alternatives should we choose for the future development of the mind? The McGraw-Hill film *Miracle of the Mind* and the Document Associates film *The Brain: Creating a Mental Elite* introduce students to the problems/possibilities of developing/controlling the mind. The activity in this section encourages students to think about six areas scientists are exploring in an attempt to understand the mind better.

Students can use the following chart to brainstorm the long-range position and negative consequences of six possible methods of mind development/control:

> Have each group prepare a chart with the following six heading: (1) Alternative Future, (2) Its Positive Long-Range Consequences, (3) Its Negative Long-Range Consequences, (4) Steps We Are Taking Toward This Alternative, (5) Is This an Alternative Future We Want to Prevent or See Realized? and (6) Why We Feel as We Do. In column 1, have the groups list the six alternative futures included below. Each group should discuss the possible consequences of each alternative future and then write their collective responses on their chart.[3]

In planning for this activity, teachers may want to ask various members of the class to read science fiction novels and short stories dealing with different types of mind control/development. *The Brain Revolution* by Marilyn Ferguson (New York: Taplinger Publishing Co., 1973) provides a scientific foundation from which to discuss these issues, and, for this reason, is an invaluable teacher reference.

The first possibility the students should consider involves electrical stimulation of the brain (ESB), a method currently being investigated by Dr. Jose Delgado. *The Terminal Man* by Michael Crichton (New York: Bantam Books, Inc., 1973) employs this type of mind control and would add another dimension to the problems/possibilities discussion of ESB.

The second avenue of research deals with the uses of positive and negative stimuli. The psychologist B. F. Skinner who works with this type of behavior modification wrote *Walden Two* (New York: Macmillan, 1948) in order to further explain his ideas through fiction.

A third alternative for mind control is described in *We* by Yevgeny Zamyatin (New York: Bantam Books. Inc., 1972, translated by Mirra Ginsburg). Students will find this account extremely interesting because it was written in the 1920's and anticipates modern psychosurgery.

Brave New World by Aldous Huxley explores a fourth alternative for mind control—the use of drugs. Students become involved in values clarification when considering this aspect of future living, particularly through the column in the chart which asks them to think about current steps we are taking toward this type of future.

Mind control achieved through propaganda and subliminal messages presents a fifth possibility. "The Subliminal Man" by J. G. Ballard in *The Mirror of Infinity*, edited by Robert Silverburg (New York: Harper and Row, 1970), and *1984* by George Orwell (New York: New American Library, 1949) provide students with fictional examples of this alternative.

Self-discipline or control from within is an alternative frequently neglected in a society which depends on the technological fix to solve its problems. This alternative is described in *Dune* by Frank Herbert (New York: Ace, 1965).

Futurists stress the importance of learning to think in terms of alternatives. The exercise the students have just completed illustrates this concept. Just as alternative futures exist, so do alternative value systems. Students must realize that in identifying their preferable futures, they will also have to identify their preferable value systems.

PSYCHIC PHENOMENA: A New Frontier

Having discussed the problems/possibilities of developing/controlling the mind, students should next consider the future potential of the mind. The following activity will encourage students to explore an area about which we know very little:

> This is an activity to help students determine their potential for extrasensory perception (ESP). You should not try this activity with your class unless a good rapport has previously been established. Students must realize that this is a serious classroom activity. Students who do not wish to participate should not have to do so.
>
> Have the class sit quietly in a semidarkened room for approximately five minutes. The five minutes of calm is very impor-

tant to relax the students and to make them more receptive to the activity. Then divide the class into pairs of students. Encourage students to choose as their partner someone with whom they feel comfortable.

Give each pair of students five different colored sheets of similarly textured paper. The class should agree on the names of the colors. The object is to try to communicate, by means of ESP, a color to another person. First, have each pair of students prepare a sheet of notebook paper so that their attempts can be recorded. Divide the sheet into two columns. Place the name of the person who will be receiving during the first round at the top of the first column, and the name of the person who will be receiving during the second round at the top of the second column.

The persons trying to send the color should breathe deeply and relax, as should the persons who will be trying to receive the color. The persons receiving should keep their eyes closed until after they have said the name of the color. The persons sending should look at the color and concentrate on sending it to their partner. After concentrating the person sending should hand the paper to the receiver, who should quietly call out the color received. Each person should try to send ten times, and the sender should record the colors that were received correctly. Then reverse the roles and let the receivers become senders.

After this part of the activity is completed, ask the class whether anyone was correct five or more times. Regroup the students and place these people together. Let them send and receive colors. Determine whether their accuracy improved or diminished.

You may want to explore answers to these questions. Did any of the students who were receiving the signals practice ESP at home? Were some students surprised that they might be able to receive messages in this way? Did some of the students have "skin sight": did they "feel" the colors with their fingers? Were some of the students receiving colors sent by a nearby group? Did the students who received the message perceive a color or did they "see" the printed word? You should explain that there is more and more evidence that this is not an extrasensory power, but that it involves senses which all human beings possess but which are not fully developed.[4]

Along with the ESP activities, plan to show the Pyramid Film *Meditation* which visually represents the various states of consciousness. The filmstrip series *Introduction to Parapsychology, Clairvoyance and Precognition* and *Telepathy* (Multi-Media Productions) narrated by a Stanford University professor, Jeffrey

Smith, explores this area in still another way. Students may then want to read *The Demolished Man* by Alfred Bester (edited by Lester Del Rey, Garland Publishing, Inc., 1975) which recounts the experiences of someone who has psychic ability. Teachers will find the February 1975 issue of *Saturday Review* a valuable resource as it includes suggested bibliographies and definitions of terms most common to the area of psychic research. *Psychic Discoveries Behind the Iron Curtain* by Shelia Ostrander and Lynn Schroeder (New York: Bantam Books, Inc., 1971) is also an excellent resource for background material.

The concept which many futurists believe to be essential for futures thinking is awareness. Teachers will find the book *New Mind, New Body* by Barbara Brown (New York: Harper and Row Publishers, 1974) discusses the importance of integrating the mind and body as a step to full awareness. One important aspect of values clarification is developing an awareness of the issues upon which decisions must be made. Students must become aware of their own values in order to participate in the futures decision-making process.

CYBORG, CLONE, CHIMERA, COMPUTER: Defining Humanness

Students who begin thinking about disposable body parts and mind control eventually have to confront the issue of when a human ceases to be human and becomes a machine. One way to explore this issue is through a role-playing activity. Set the stage by telling the students that a millionaire had died and left a sizable sum of money to each of the following:

her clone;
a purple cyborg who once saved her life;
a man with gills who lives and works in one of her underwater factories;
her android butler; and
a computer connected to her detached brain.

Explain that the law in the year 2026 states that only "persons" can inherit. The computer has claimed all of the money, arguing that the woman is not really dead. The clone claims that she is the only "person" among those named in the will and is, therefore, entitled to all the inheritance. The millionaire's son who was disinherited for his work in the Society for the Preservation of Purity Among Humans claims that none of the above are "persons" and

that he is entitled to the entire inheritance. Have various members of the class role play the potential heirs and their attorneys while the rest of the class serves as a panel of judges who must decide the case. At the conclusion of the activity, ask the students to identify the values on which they based their decisions.

The film *Future Shock* (McGraw-Hill Films) raises many of the value laden issues set forth in this activity. *Caves of Steel* by Isaac Asimov (Garden City, New York: Doubleday, 1954) illustrates the problems of humans and androids interrelating. Teachers will find *As Man Becomes Machine* by David Rorvik (Garden City, New York: Doubleday, 1971) another valuable resource because of the manner in which the author deals with this issue.

The concept emphasized in this activity is the interrelated nature of systems. Students need to realize that value systems exist and begin to determine whether or not their values form a unified system. The Club of Rome, one of the world's leading groups of futurists, has turned its attention to an examination of global values systems and their importance for the future. For further information on this project, see the "Goals for Global Society," the chapter by Ervin Laszlo in *The Next 25 Years: Crisis and Opportunity*, edited by Andrew A. Spekke, pp. 57-59.

THE DECISION MAKERS: WHO SHOULD THEY BE?

Once the students become aware of the issues raised by the biological revolution and the crucial decisions which have to be made now for the future, they are ready to discuss the question presented in the second chapter: Who should make these decisions? The individual? An impartial board? Religious or philosophical authorities? The government? Scientific experts?

THE BIOLOGICAL REVOLUTION: Life and Death Decisions

The first activity—When it's life or death: How do you decide?—is taken from *Come Let Us Play God* by Leroy Augenstein (New York: Harper and Row, 1969). This book contains numerous examples of the moral dilemmas which Dr. Augenstein actually confronted. To prepare for this activity, write the following case on a transparency in such a way that students learn only part of the facts at a time:

> The sixty-six-year-old grandfather had both kidneys go bad, and there was great difficulty in maintaining adequate function on a kidney machine. When cell matchings were run on the other members of the family, it was found that the twenty-two-year-old grandson's cells were remarkably similar to the grandfather's. Thus if an operation were run, there was a good chance the grandfather would live at least another year and perhaps two or three—at most five more years. However, the loss of one kidney would probably reduce the life expectancy for the grandson by as much as ten years, unless there are some really significant technological developments in the immediate future. In most cases a person with only one kidney has an almost normal life expectancy, but the attending physician said that this was probably not the case here because the grandfather's kidney failure appeared to be the result of a genetic defect that runs in the family.
>
> When I first talked to them the grandson said he was very eager to donate his kidney, whereas the grandfather was dubious as to whether he ought to accept it. Would you recommend to this family that they go ahead with the operation?
>
> Before asking my next question, let me add another piece of information. One reason I was called is that the grandfather was an outstanding surgeon who saves between a hundred and

> three hundred lives a year. Further, he was still operating, one year past the normal retirement age, because he serves a large, remote area, and for five years they have been unsuccessful in getting a younger man to come in and take over his practice. Now, would you advise the grandfather to accept that kidney? If you are inclined to say yes, do you want to change your vote when I tell you that the grandson has a two-year-old daughter and that his wife is pregnant again? Further, he is a promising graduate student training for medical research. Thus, he might conceivably make some discovery that would save many thousands of lives. However, that is only a hope, whereas the grandfather's ability to save lives is more of a reality even at his advanced age.
>
> With all the facts on the table now, how would you advise this family? Incidentally, would your vote be different if you knew that either the surgeon or his grandson is a nice guy or a foul-tempered so-and-so?[5]

Point out that we are having to make these kinds of decisions with less and less response time. In order to examine the psychological, moral, ethical, and legal aspects of these kinds of decisions, ask the students to think in terms of What If—

1. the potential donor were a minor?
2. the doctor did not inform the family about the possibility of a transplant because he knew of no donor?
3. the family's religious beliefs precluded such an operation?
4. the grandson dies as a result of the operation?

To further emphasize that the biological revolution is already underway, have the students keep a biological dilemma notebook based on the reports that they have clipped from current newspapers and periodicals. Allow class time for the discussion of these materials. Be certain to have the students think in terms of the long-range consequences of each discovery. *Four Futures*, edited by R. A. Lafferty (New York: Hawthorn Books, Inc., 1971,) explores themes from the biological revolution. In one scenario individuals in the future live to be 200. Since no one can be born into this society until someone agrees to die, the government has established an institution for this purpose. Before the person voluntarily agrees to die, the government will see that all unfulfilled wishes come true—at government expense. Students should discuss the ethical, moral, legal, and psychological problems posed by life/death in this society. For further reading in this area, teachers

should see the chapter entitled "Faustian Powers and Human Choices: Some Twenty-First Century Technological and Economic Issues" by Herman Kahn and Anthony J. Wiener in *Environment and Change: The Next Fifty Years,* edited by William R. Ewald, Jr. (Bloomington: Indiana University Press, 1968), pp. 101-131.

The concept of human choice is crucial to futures thinking. Because of the rapidly accelerating rate of change, humans now must make decisions which people in the past did not have to consider. Values clarification is even more essential because of the rapid rate of change and the myriad of new situations which confront us in making value judgments now for the future. Many futurists point out that we must begin to clarify our values now before the new situations arise. This is particularly important in a time when the response rate is shortened and we are called upon to make decisions both individually and as a society which will have long-range impact on the future of humanity. For further reading in the area of moral dilemma discussions, teachers should see Ronald E. Galbraith and Thomas M. Jones, "Teaching Strategies for Moral Dilemmas: An Application of Kohlberg's Theory of Moral Development to the Social Studies Classroom" in *Social Education*, January 1975, pp. 16-22 and Lawrence Kohlberg, "The Child as a Moral Philosopher" in *Readings in Values Clarification*, edited by Sidney Simon and Howard Kirschenbaum (Minneapolis: Winston Press, Inc., 1973), pp. 49-61.

THE BIOLOGICAL REVOLUTION: Protecting Human Rights

The next activity asks the question, What additional guarantees (if any) are needed for a bill of rights in the future? To introduce this activity, show *Human Issues in Sciences,* a four-part filmstrip/cassette series produced by Scholastic Magazines, Inc. Through such cases as the Nazi concentration camps, the Tuskeegee Project, and the Willowbrook State School, students learn of past abuses in the area of medical experimentation and then consider the various proposals for protecting human rights such as the Nuremburg Code.

To begin the activity in this section, students should make a list of possible developments in the biological revolution which they believe will occur during their lifetime. Next have them apply the Bill of Rights to these developments. For example, do clones have rights? Is implanting an electrode in the brain an invasion of privacy? Does an individual have the right to die? Does the fetus

have rights? What is the definition of "informed consent"? In what ways has the Constitution already been adapted to meet changing needs? How should the Constitution be expanded (if at all) in the light of the biological revolution? Students may then want to read the "Bill of Rights for 1984" by Richard Farson in *Worlds in the Making: Probes for Students of the Future*, edited by Mary Jane Dunstan and Patricia Garland (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970), pp. 361-367, and then compare it with the rights of people living in *1984*, written by George Orwell. At this point students could also examine the Universal Declaration of Human Rights adopted by the United Nations.

The futures concept illustrated by this section is the interrelationship of past, present, and future. While futurists see no relationship because of the rapid changes which are presently occurring, most futurists believe that the decisions being made today are affecting the shape of the world of tomorrow. Students should realize that becoming a futurist does not mean that all values from the past have to be rejected. It is important to consider which traditional values are worth preserving, particularly with respect to the changes presented by the biological revolution.

Robert Theobald is one futurist concerned with preserving values from the past. He describes the need to think seriously about the implications of the biological revolution in his chapter, "Toward a More Perfect Union," in *The Next 25 Years: Crisis and Opportunity*, edited by Andrew A. Spekke, pp. 344-349.

THE BIOLOGICAL REVOLUTION: Applying the Controls

Students should next consider what biological research should be funded, restricted, or prohibited now for the future. To prepare for this activity, use the following chart from *The Biological Time Bomb* to point out future possibilities:

TABLE OF DEVELOPMENTS

PHASE ONE: by 1975

Extensive transplantations of limbs and organs
Test-tube fertilization of human eggs
Implantation of fertilized eggs in the womb
Indefinite storage of eggs and spermatozoa
Choice of sex of offspring
Extensive power to postpone clinical death

Mind-modifying drugs: regulation of desire
Memory erasure
Imperfect artificial placenta
Artificial viruses

PHASE TWO: by 2000

Ex ensive mind modification and personality reconstruction
Enhancement of intelligence in men and animals
Memory injection and memory editing
Perfected artificial placenta and true baby-factory
Life-copying: reconstructed organisms
Hibernation and prolonged coma
Prolongation of youthful vigor
First cloned animals
Synthesis of unicellular organs
Organ regeneration
Man-animal chimeras

PHASE THREE: after 2000

Control of aging: extension of life span
Synthesis of complex living organisms
Disembodied brains
Brain-computer links
Gene insertion and deletion
Cloned people
Brain-brain links
Man-machine chimeras
Indefinite postponement of death[6]

Either individually or in a small group examine the Table of Developments, indicating your attitude toward these innovations.

1. Would you fund research, restrict research, or prohibit such research aimed at achieving them?
2. What would be the long-range consequences of these developments?

Students should individually and then in groups determine whether or not they would fund, restrict, or prohibit research for each of the areas listed. Phase One (1975) of the Table of Developments shows students that futurists are not always correct in making forecasts, which is a valuable lesson in futures thinking. Students should also consider why some of these changes have not yet occurred.

We are not suggesting any science fiction in this section, but hope that by this time students will want to write their own, based on a theme from *Future Shock* or *The Biological Time Bomb.* Writing science fiction is also a very good way of expressing and clarifying values. In making this assignment, ask students to describe either a preferable or a dystopian future. When the students share their science fiction stories with each other, have them discuss the values being promoted in each. They may be surprised to find that one person's utopia is another's dystopia. For a discussion of valuing and futures thinking, teachers should read the chapter by Sidney Simon and Howard Kirschenbaum entitled "Values and the Futures Movement in Education" in *Learning for Tomorrow,* edited by Alvin Toffler (New York: Vintage, 1974), pp. 257-270.

While the concept of preventing, altering and/or inventing futures is accepted by futurists, students often feel that little can be done to change the future. Hopefully, throughout this unit, students have learned that alternative futures exist and that steps can be taken to make the most desirable of these futures a reality. According to Simon and Kirschenbaum, a value is something you believe and are willing to act upon. Students must realize that the values upon which they are acting today are in fact creating the world of tomorrow.

THE BIOLOGICAL REVOLUTION: Determining Your Role

The next activity raises the question: What values should we apply in assessing biological research now for the future? One way to involve students in values clarification is to have them participate in a simulation. "Future Decisions: The I.Q. Game" (Simulation and Gaming Association Publications, RR 2, Greentree Road, Lebanon, Ohio 45036) was designed to make students aware of the long-range consequences of the decisions being made today for tomorrow. It also illustrates many of the other futures concepts which have been discussed in previous sections. Teachers can use this simulation either to introduce the biological revolution and its futures impact or as a culminating activity to determine how effective the unit has been. Student reaction will vary depending upon when the game is used.

In this simulation participants are given the choice to serve or not to serve on a hospital board charged with allocating a scarce I.Q. drug. Those not serving on the board function as observers

who note the values on which the various board members are basing their decisions. When the board has finished its work, there follows a general debriefing in which these values are discussed. The values which compelled the observers not to serve are also explored. The debriefing continues with the use of a cassette tape which forces the participant to consider the long-range implications of the decisions they have been making. To bring the students back to reality, the cassette closes with a quotation from *The Biological Time Bomb.* For a more complete description of how this game is played with students, see the November 1974 issue of *Media & Methods* and the August 1974 issue of *The Futurist.*

Flowers for Algernon by Daniel Keyes (New York: Bantam Books, Inc., 1967) involves students in values clarification in still another way as they watch the results of an experiment designed to raise the I.Q. of a retarded individual. For a more complete discussion of these issues from the viewpoint of scientists, teachers should write for the report prepared by Dr. John Edsall under the title *Scientific Freedom and Responsibility,* published by the American Association for the Advancement of Science, 1515 Massachusetts Avenue, N.W., Washington, D.C. 20005.

The concept for this section is long-range thinking. Futurists stress the importance of considering the long-range consequences before decisions are made. When acting upon values, it is also important to examine the long-range impact of these values on those who will be living in the future.

THE UNIVERSE AS A BIOLOGICAL LABORATORY: THE ULTIMATE QUESTION

The third chapter focuses on the question: What is the relationship of the human to the universe? In discussing the biological revolution, many people fail to consider that changing the human may ultimately change the universe. Conversely, altering the universe may bring about profound changes in humanity. In order to evaluate the long-range impact of the biological revolution, we must become aware of the current proposals, to interfere with the evolutionary process not only on our own, but on other planets. Such value laden questions can now only be examined through the futures perspective.

BIOLOGICAL ENGINEERING ON A UNIVERSAL SCALE: Defining the Limits

Biologists are already proposing that we alter the universe to fit a human design. The activity in this section poses the question: Under what conditions should we interfere with life on another planet? Set the stage for a debate by describing the plot of *The Last and First Men,* a novel by Olaf Stapleton (New York: Penguin, 1938). In this novel—in order to avoid extinction—the human race must decide whether or not to alter the atmosphere of another planet. The dilemma: living organisms are found in the atmosphere of this planet. The question: should the planet be altered so that the human race can survive? After students debate this issue, point out that astronomy Professor Carl Sagan has already developed a method for changing the atmosphere of Venus. He proposes to introduce blue-green algae into the atmosphere in order to bring about rain, thereby changing its climatic conditions. His proposition has already been laboratory tested. For a description of this project, see *The Next Ten Thousand Years* by Adrian Berry (New York: New American Library, 1974), pp. 67-68.

The film "2001: A Space Odyssey" explores the relationship of the human to the universe in another context. *The Martian Chronicles* by Ray Bradbury (New York: Bantam Books, 1972) and *Solaris* by Stanislas Lem, translated by Joanna Kilmartin and Steve Cox (New York: Walker, 1970), examine human contact

with other worlds and point out the potential damage earthlings could bring to their new environment unless their values change. *Solaris* underscores the danger of exploring the unknown before people fully understand themselves. Teachers will find that the February 1976 issue of *The Futurist* is devoted to "Space Colonies: The Higher Frontier" and will serve as a stimulus for further discussion in this area.

The concept is spaceship earth/universe. It may be surprising to find this concept in a unit on the biological revolution. However, we are already altering the environment of our own planet and can extend this potential to space in the future. The values which we apply to our own planet should be seriously examined before we apply them to space exploration.

BEYOND BIOLOGY: Developing Exobiology

Perhaps the most value laden series of issues to be examined through the futures perspective are those which would arise if we were to come in contact with life on other planets. As Carl Sagan points out in *The Cosmic Connection* (New York: Dell Publishing Co., 1975), the science which will profit most from such a discovery will be biology. He adds that ". . . biologists have been studying only one form of life on Earth."[7] In space exobiologists (those who study extraterrestrial life) may encounter other forms which may give them an entirely new perspective and completely revolutionize the biological sciences.

As a way of introducing this section, explain the similarities of the various life forms on this planet. Teachers from disciplines other than biology may want to invite a guest speaker or have a student interested in biology make this presentation. To evaluate the impact of the discovery of extraterrestrial life forms on all aspects of human existence, have the students make a futures wheel. (Note: Instructions for making a futures wheel can be found in the article entitled "Easy Ways to Help Children Think About the Future" in the August 1974 issue of *The Futurist*, p. 187.) For a fictionalized account of an encounter with a new form of life see *The Andromeda Strain* by Michael Crichton (New York: Knopf, 1969).

Since the future will always hold the unexpected, futurists believe that people will continue to need to be flexible and adaptable to change. Students should seriously discuss whether or not values must also be flexible and adaptable.

THE UNIVERSE AS TEACHER: Exploring the Unknown

The activity in this section is: What do humans have in common with mung beans? Several days before showing the film *The Ultimate Mystery* produced by Hartley Productions, Cos Cob, Connecticut, ask for student volunteers to participate in an experiment. Have them grow the same number of mung beans in two jars. They should love one jar and simply water the other. Have them bring both jars to class the day that the film will be shown. One segment of this film features a class of science students who have participated in a similar experiment. Viewers see that the "loved" beans filled the jars and continued to grow while the growth of those which were ignored was not nearly so rapid. Former astronaut Edgar Mitchell opens this film by talking about the changes which occurred within him when he first saw the earth from space. He is currently seeking to understand more fully the relationship of humans to the universe. *The Ultimate Mystery* explores the untapped potential of the human, and viewers are shown how scientists are seeking to probe some of the mysteries of the human mind/body.

Teachers may want to summarize or have advanced students read *The Dispossessed* by Ursula LeGuin (New York: Avon Books, 1975), which describes a colony of people living on a moon where they have few resources and have had to learn to live in harmony with their environment.

Holding a poetic reverence for the universe is an important concept in futures thinking. George Leonard is one of the futurists whose work exemplifies this concept. In his book *The Transformation* (New York: Delacorte Press, 1972), he maintains that humans are evolving to a higher state of consciousness. This heightened awareness is demonstrated by their ability to live in harmony with themselves and their environment. Students should examine their values in relationship to the universe and discuss whether or not their actions demonstrate a poetic reverence for it.

THE UNIVERSE FROM WITHIN AND WITHOUT: Discovering the Cosmic Connection

Students should examine the relationship of their biological systems to the universe. To introduce the activity for the last section, show the film "Cosmic Zoom" (McGraw-Hill) and then read the following passage from "Four Quartets" by T. S. Eliot:

We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time. . . .[8]

As a culminating activity, students should create a multimedia presentation showing the relationship of inner and outer space. Teachers will find still more ideas from reading *The Innerspace Project* by Jeff Berner (New York: World Publishing, 1972).

The concept for this section is inner space/outer space. As shown in the film, a universe exists within each of us and we are each a part of a larger whole—a concept that baffles many people. On one level, it can be looked at from the viewpoint of systems think. On another level it can be examined from the perspective of the ecologist. On still another level it can be perceived through the developing awareness described by George Leonard and ultimately experienced in the tradition of the world's great mystics. Journeying into inner and outer space on any level will help students develop a greater understanding of themselves and their values.

VALUES/ACTIONS: Defusing the Biological Time Bomb

Once students have started to integrate inner and outer space and begun to clarify their values through the futures perspective, they should return to the present. By this time they will have become sufficiently aware of the issues presented by the biological revolution to want to become more personally involved through action. Some will heed the words of Dr. Leroy Augenstein and inform others of its problems/possibilities. Still others will want to interview political candidates in order to determine their stands on various biological issues. Those who choose to make a more personal commitment may enroll in an organ donor program. Depending upon their beliefs, students may decide to participate actively in programs such as Zero Population Growth or Right to Life. To prevent an undesirable future, they may want to volunteer to work with organizations such as the March of Dimes in order to conquer birth defects or they may choose to work with a local hunger crisis center in order to change the future by improving the present. The biological time bomb can be defused only if we take action today.

FOOTNOTES AND REFERENCES

[1]Howard, Mary Kay, and Franks, Betty Barclay. *Looking Forward: A Mini-Course in Future Studies.* New York: McGraw-Hill, 1975. pp. 23-24.

[2]*Ibid.*, p. 20.

[3]*Ibid.*, p. 25.

[4]*Ibid.*, p. 26.

[5]Augenstein, Leroy. *Come Let Us Play God.* New York: Harper & Row, 1969. pp. 1-2.

[6]Taylor, Gordon Rattray. *The Biological Time Bomb.* New York: Mentor Books, 1969. p. 205.

[7]Sagan, Carl. *The Cosmic Connection.* New York: Dell Publishing Co., 1975. p. 53.

[8]Eliot, T. S. "Four Quartets." *The Complete Poems and Plays of T. S. Eliot.* New York: Harcourt, Brace and Company, 1950. p. 145.

BIBLIOGRAPHY

TEACHER AND STUDENT RESOURCES

Augenstein, Leroy. *Come Let Us Play God.* New York: Harper and Row Publishers, 1969.

Berry, Adrian. *The Next Ten Thousand Years: A Vision of Man's Future Universe.* New York: New American Library, 1974.

Brown, Barbara. *New Mind, New Body.* New York: Harper and Row Publishers, 1974.

Edsall, John. *Scientific Freedom and Responsibility.* Washington, D. C.: American Association for the Advancement of Science.

Eliot, T. W. "Four Quartets." *In The Completed Poems and Plays.* New York: Harcourt, Brace and Company, 1950.

Farson, Richard. "Bill of Rights for 1984." *Worlds in the Making.* (Edited by Mary Jane Dunstan and Patricia Garland.) Englewood Cliffs, New Jersey: Prentice-Hall, 1970.

Ferguson, Marilyn. *The Brain Revolution.* New York: Taplinger Publishing Co., 1973.

Goodykoontz, William F., ed. *The Future: Can We Shape It?* New York: Scholastic Magazines, Inc., 1973.

Howard, Mary Kay, and Franks, Betty Barclay. *Looking Forward: A Mini-Course in Future Studies.* New York: McGraw-Hill, Inc., 1975.

Kahn, Herman, and Wiener, Anthony J. "Faustian Powers and Human Choices: Some Twenty-First Century Technological and Economic Issues." *Environments and Change: The Next Fifty Years.* (Edited by William R. Ewald, Jr.) Bloomington: Indiana University Press, 1968.

Kohlberg, Lawrence. "The Child as a Moral Philosopher." *Readings in Values Clarification.* (Edited by Sidney Simon and Howard Kirschenbaum.) Minneapolis: Winston Press, Inc., 1973.

Laszlo, Ervin. "Goals for Global Society." *The Next 25 Years.* (Edited by Andrew A. Spekke.) Washington, D.C.: World Future Society, 1975.

Leonard, George. *The Ultimate Athlete: Re-Visioning Sports, Physical Education, and the Body.* New York: Viking Press, 1975.

McHale, John. *The Future of the Future.* New York: George Braziller, 1969.

McDanield, Michael A., and Mendell, Jay S. "What Futurists Can Learn from Creative Problem Solvers." *The Next 25 Years.* (Edited by Andrew A. Spekke.) Washington, D.C.: World Future Society, 1975.

Ostrander, Sheila and Schroeder, Lynn. *Psychic Discoveries Behind the Iron Curtain.* New York: Bantam Books, Inc., 1971.

Restak, Richard M. *Premeditated Man: Bioethics and the Control of Future Human Life.* New York: Viking Press, 1975.

Rorvik, David. *As Man Becomes Machine.* Garden City, New York: Doubleday, 1971.

Simon, Sidney and Kirschenbaum, Howard. "Values and the Future Movement." *Learning for Tomorrow.* (Edited by Alvin Toffler.) New York: Vintage Books, 1974.

Taylor, Gordon R. *The Biological Time Bomb.* New York: New American Library, 1968.

Theobald, Robert. "Toward a More Perfect Union." *The Next 25 Years.* (Edited by Andrew A. Spekke.) Washington, D.C.: World Future Society, 1975.

SCIENCE FICTION

Asimov, Isaac. *Caves of Steel.* Garden City, New York: Doubleday, 1954.

_____. *Fantastic Voyage: An Amazing Journey Through the Human Blood Stream.* Boston: Houghton Mifflin Co., 1966.

Ballard, J. G. "The Subliminal Man." *The Mirror of Identity.* (Edited by Robert Silverburg.) New York: Harper and Row Publishers, 1970.

Bester, Alfred. *The Demolished Man.* New York: New American Library, 1953.

Bradbury, Ray. *The Martian Chronicles.* New York: Bantam Books, Inc., 1972.

Crichton, Michael. *The Terminal Man.* New York: Bantam Books, Inc., 1972.

Herbert, Frank. *Dune.* New York: Ace Books, 1965.

Huxley, Aldous. *Brave New World.* New York: Bantam Books, Inc., 1962.

Keyes, Daniel. *Flowers for Algernon.* New York: Bantam Books, Inc., 1967.

Lafferty, R. A., editor. *Four Futures.* New York: Hawthorn Books, Inc., 1971.

LeGuin, Ursula. *The Dispossessed.* New York: Avon Books, 1975.

Lem, Stanislas. *Solaris.* (Translated by Joanna Kilmartin and Steve Cox.) New York: Walker, 1970.

Orwell, George. *1984*. New York: New American Library, 1949.

Silverburg, Robert, editor. *The Mirror of Infinity*. New York: Harper and Row Publishers, 1970.

Skinner, B. F. *Walden Two*. New York: Macmillan Co., 1948.

Stapleton, Olaf. *The Last and First Men*. New York: Penguin Books, 1938.

Zamyatin, Yevgeny. *We*. (Translated by Mirra Ginsburg.) New York: Bantam Books, Inc., 1972.

PERIODICALS

"Educators Futurize Their Courses." *The Futurist*, August 1974.

Galbraith, Ronald E. and Jones, Thomas M. "Teaching Strategies for Moral Dilemmas: An Application of Kohlberg's Theory of Moral Development to the Social Studies Classroom." *Social Education* 39, No. 1 (January 1975), pp. 16-22.

Media and Methods, November 1974. (Entire issue is devoted to futuristics education.)

O'Neill, Gerard K. "Space Colonies: The High Frontier," *The Futurist*, 1976, pp. 25-34.

Saturday Review, February 1975. (A valuable resource.)

FILMS

The Brain: Creating a Mental Elite. Documents Associates Films.

Future Shock. 42 min./color. McGraw-Hill Films.

Man the Incredible Machine. National Geographic Films.

Man-Made Man. McGraw-Hill Films.

Meditation. Pyramid Films.

Miracle of the Mind. McGraw-Hill Films.

2001: A Space Odyssey. M.G.M. Films, Inc.

The Ultimate Mystery. Hartley Productions, Cos Cob, Connecticut.

FILMSTRIPS

Human Issues in Science. Four-part filmstrip/cassette series. Produced by *Scholastic Magazine*.

Introduction to Parapsychology—Clairvoyance and Precognition. Narrated by Jeffrey Smith. Multi-Media Productions.

Introduction to Parapsychology—Telepathy. Narrated by Jeffrey Smith. Multi-Media Productions.

Redesigning Man: Science and Human Values. Harper and Row Publishers, Inc.

SIMULATION

Franks, Betty Barclay. "Future Decisions: The I. Q. Game." Simulations and Gaming Association Publications. RR 2, Greentree Road, Lebanon, Ohio 45056.